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BIOLOGICAL SUGGESTIONS.

ANIMAL SENSE PERCEPTIONS.

By W. L. DISTANT.

Whether Bees are susceptible of feeling and capable of thought is a question which cannot be dogmatically answered.—HUXLEY.

It is indeed still not infrequently the custom to deny absolutely to the lower animals reason and religion.—HAECKEL.

It is, I think, generally assumed not only that the world really exists as we see it, but that it appears to other animals pretty much as it does to us. A little consideration, however, is sufficient to show that this is very far from being certain, or even probable.—Lord AVEBURY (Sir JOHN LUBBOCK).

UNDERLYING all our conceptions of Animal Mimicry and Protective Resemblance is the predicate that other animals see the various objects of nature in similar size, shape, and colour as we do ourselves; in other words, that, though the sensory organs of sight may vary, the practical result is still identical. The same remark applies in a general way to a belief in a more or less universal and similar sensation of touch, smell, taste, and hearing, though on examination it is surprising to find how little positive information exists to warrant the conclusion, even though it may be an absolute fact. If Berkeley asked the old materialistic philosophers whether they could prove the existence of a material world external to the mind, may we not also ask for some more definite proof of the unity and similarity in the sense perception

of animals? If Teufelsdröckh reduced society to a theory of clothes, it would seem that many advocates of Mimicry represent nature by a theory of masks. We observe a strong similarity between an animal and its environment, or between one which we believe possesses a quality procuring immunity from attack, and another in which that quality is absent, and we conclude that the resemblance or mimicry is equally observable by other creatures. Surely an element of error is present in this deduction. Is our world as we see it—and thus can only imagine it—the same in actual identity as that known by the sense cognitions of all animal life? If, as has been ably remarked, the universe contained only blind and deaf beings, it is impossible for us to imagine but that darkness and silence should reign everywhere.* If, on the other hand, we allow—as surely we ought—variation to exist in sense perceptions, as it undoubtedly does in the structure of sense organs, then, without leaving this planet, we may well understand that there are “other worlds than ours.” Even in homology and variation, as Bateson has observed, “we have allowed ourselves to judge too much by human criterions of difficulty, and we have let ourselves fancy that nature has produced the forms of life from each other in the ways which we would have used, if we had been asked to do it.”† Our knowledge of the sense organs in the lower animals is still very imperfect, and sometimes erroneous. Thus Weismann, in his lecture on the “Retrogressive Development in Nature,” delivered in 1866, refers to the “Cæcilians, tropical worm-like or snake-like Amphibians, living underground,” as having “lost not only the sense of sight, but that of hearing also.” When this lecture was translated and published in this country a few years later, the author added a footnote, that “Recent researches have shown us that these animals not only possess a complete auditory apparatus, but that it is even more perfect than in other Amphibia”; and he adds, as a justification for the statement on which he founded his former conclusions, that “Up to the present time our knowledge of the auditory organ of *Cæcilia* has been founded upon the statements of two excellent observers, Professors Retzius and Wiedersheim; but the material at their

* Huxley, ‘Collected Essays,’ vol. vi. p. 258.

† ‘Materials for the Study of Variation,’ p. 33.



disposal was restricted to a few badly preserved specimens.”* The importance of a clear comprehension of animal sense cognitions when a theory like that of mimicry is propounded must be obvious. Take, for instance, a bird and a protectively coloured caterpillar, such as it appears to our cognitions. Should the power of vision in the bird be in excess of that possessed by ourselves, the resemblance may be only superficial and powerless ; should it be less, then the protection may be excessive—an idea almost unthinkable in the light of the doctrine of natural selection. We may see what appears to be, and may be, wonderful assimilative colouration or mimicking disguise, but the creature so protected, as it appears to us, may be readily detected by a keenness of scent in its enemies, of which we know little, or by a power of hearing, of which we know less. We certainly do not hear a tithe of the sounds produced by insects ; the effect of some stridulating organs we can only comparatively estimate by their structural affinities to others of a more developed character, and which produce sounds capable of being recognized by our own sense of hearing. It is probable that many insect enemies discover their prey by sound alone.† Other creatures find their food without apparently either sight or hearing. According to Jonathan Couch, the common Sea-hog or Sea-egg (*Echinus esculentus*), “though apparently destitute of every sense, or possibility of regarding external objects by sight or hearing,‡ will travel up

* ‘ Essays upon Heredity, &c.’ Eng. transl. vol. ii. p. 9.

† “It is of course possible, if not probable, that Ants, even if deaf to sounds which we hear, may hear others to which we are deaf” (Lord Avebury (Sir John Lubbock), ‘Ants, Bees, and Wasps,’ p. 228).—“There are sounds which we cannot hear, there are sights which the eye cannot see. But besides all these there must be countless aspects of external nature of which we have no knowledge; of which, owing to the absence of appropriate organs, we can form no conception ; which imagination cannot picture, nor language express” (Balfour, ‘Foundations of Belief,’ p. 69).—On the other hand, Mr. Pocock asserts that “there is not a particle of evidence that either the large Spiders or the Scorpions can hear the sounds that their own stridulating organs emit” (‘Natural Science,’ vol. ix. p. 24).—Mr. Edmund Selous inclines to the view that “thought transference” occurs among birds (‘Bird Watching,’ p. 219 *et seq.*).

‡ By experiment, Romanes found “the Echini manifesting a strong disposition to crawl towards, and remain in, the light” (‘Jelly-Fish, Star-Fish, and Sea-Urchins,’ p. 319).

the rods of a crab-pot, enter the opening, descend within, mount again to the situation of the bait, and select the particular one that pleases it best."* The homing habits of the Common Limpet (*Patella vulgata*) have been ascribed to the possession of a "locality sense."†

Nearly all writers and investigators have felt the difficulty in properly describing the sensory impressions of animal life. According to Prince Kropotkin :—"We must be prepared to find that the usual division of senses into touch, taste, smell, vision, and hearing will not do for the whole series. The senses must be rather divided into a mechanical, chemical, temperature, and light sense, to which the electrical sense will perhaps have to be added. Such a division undoubtedly better answers to the senses which exist in the lower animals, and when the series is considered in an ascending order, the gradual differentiation of the chemical sense into taste and smell, and of the mechanical sense into touch, hearing, and pressure sense, becomes evident."‡ Brehm states that careful observations on the habits of Mosquitos "places it beyond doubt that in the discovery of their victim they are guided less by sight than by smell, or perhaps, more correctly, by a sense which unites smell and tactile sensitivity;§ while Mr. J. A. Thomson, in an editorial note, remarks: "The somewhat mysterious reference which Brehm makes to a sense between smell and touch is thoroughly justifiable. To the senses of many of the lower animals—and even of fishes—it is exceedingly difficult to apply our fairly definite human conceptions of smell, taste, touch, &c."|| The restlessness or alarm shown by birds or other animals before the occurrence of an earthquake sensible to man is well known, and is probably due to the very small tremors which precede the larger vibrations.¶ Dr. Alexander Hill has recently sympathetically approached this subject, and we give one extract in his own words :—"If we try to figure to ourselves the mental activities of any animal, we

* 'Illustrations of Instinct,' p. 12.

† Cf. Lloyd Morgan and J. R. A. Davis, 'Nature,' Dec. 6th, 1894, and March 28th, 1895.

‡ 'Nineteenth Century,' vol. xl. p. 252.

§ 'From North Pole to Equator,' p. 84.

|| *Ibid.* p. 568.

¶ Cf. 'Nature,' vol. liv. p. 424.

recognize at once that its thought must take the colour of the sense by which they are chiefly prompted. A Dog, for example, does not recognize 'a family likeness,' but a family smell. In a day of happy wandering down the village street, and through the lanes, it pays no attention to the picturesque. As it lies in front of the fire, reviewing the experiences of the day, it recalls a long succession of suggestive smells. It is the cheek-bristles of the Otter which vibrate with excitement as it remembers the slippery-sided Salmon it nearly mistook for an alder-root. The Cat twitches its ears as it dreams of bursting unannounced into a seminary of Mice. If we wish in any degree to realize what our thoughts would be like if we were to exchange our brain for the brain of some other animal, we must ask, first, Which of the five sense organs is the one through which this particular animal chiefly looks out upon the world?"* Again :—"We see with the clearness of the lower vertebrates—birds, reptiles, and fishes, in which vision is mono-scopic—although we, in common with Monkeys, and some other of the higher vertebrates, have acquired the power of stereoscopic vision."† Jordan and Kellogg, in a recent volume in which the theory of mimicry is treated as an absolute fact, still remark :—"It will be recognized that in the study of how other animals feel and taste and smell and hear and see, we shall have to base all our study on our own experience. We know of hearing and seeing only by what we know of our own hearing and seeing; but by examination of the structure of the hearing and seeing organs of certain other animals, and by observation and experiments, zoologists are convinced that some animals hear sounds that we cannot hear, and some see colours that we cannot see."‡ If we consider the lives of purely nocturnal animals, the fact is impressed on our minds with irresistible force, that the world they see and know must have a totally different aspect to what we realize by the light of day, whilst their living environment is also under different conditions. Except on moonlight nights darkness must reign supreme, whilst a general silence replaces the hum of animal life, and nature ever seems to sleep. Such must be the experi-

* 'Introduction to Science' (Temple Encyclop. Primers), p. 32.

† *Ibid.* p. 38.

‡ 'Animal Life,' pp. 224-5.

ence of an animal like the Tasmanian Devil (*Sarcophilus ursinus*). The Common Earthworm must possess little cognition of a material world external to its very limited sense perceptions. As remarked by Darwin :—"Worms are poorly provided with sense organs, for they cannot be said to see, although they can just distinguish between light and darkness: they are completely deaf, and only have a feeble power of smell: the sense of touch alone is well developed."* The world as we know it is therefore actually non-existent to these simply organised animals.

The microscope reveals the existence of living beings of which by our unaided eyesight we should have scarcely dreamed; or, if the scientific imagination had been compelled to predicate their being to account for physical and evolutionary results, we should still have been in profound ignorance as to their structure, life, or habits.† So we may readily imagine some animals as possessing a sense of vision unfolding the details of nature around us in a manner far beyond our ken, while others may have the sensations of sight so blunted and obtuse that only the mighty things of the world come under their individual notice. If we allow our reason to run riot with the first reflection, we can conceive a sky and earth very dissimilar to those of our experience. Through an atmosphere clouded with dust and germs such beings should gaze upon a sun by day as only known at present by our telescopes; at night the story told by astronomers would be exhibited to their unaided eyes: all ideas of dimension would be increased; the hidden things of natural life would be exposed; animal and vegetable tissues would appear transformed, and our ideas as to assimilation in colour and structure be in many cases destroyed, and others created of a fuller and more comprehensive type.

* 'The Formation of Vegetable Mould,' &c. p. 315.—In the words of G. H. Lewes, "Light, colour, sound, pain, taste, smell are all states of consciousness, and nothing more. Light with its myriad forms and colours—sound with its thousandfold like—make nature what nature appears to us; but they are only the investitures of the mind. Nature is an eternal Darkness—an eternal Silence."

† "Beyond the reach of the microscope, there are still worlds of events in nature which we can never see, although we may infer the existence of some of them in other ways."—G. J. Storey (Sci. Proc. R. Dubl. Soc. n.s. vol. viii, p. 280).

Under the second supposition the mystery of life would be still more behind the veil than at present, natural causation would be even less understood ; things would be fewer and farther away, the smaller non-existent, the larger more superficially appreciated. Would nature be the same under such different conceptions ?—and yet the sense of sight has been alone considered. With a difference in the sensory organs or sensations of smell, a fetid stink might be appreciated as a sweet odour ; touch may from a similar reason become an unknown and unimagined power, or an imperfectly realized sensation ; from a like cause taste may be so varied as to be outside the nauseous or agreeable experiences ; while the sense of hearing might develop a familiarity with sounds of which we are absolutely ignorant, or otherwise prove oblivious to some of our most common perceptions.* Without losing ourselves in metaphysical subtleties as to whether things really exist as cognizable by our sense organs, or whether much of our materialism is not only to a considerable degree a question of sensation, we must at least push that problem beyond ourselves, and estimate it throughout all animal life if we hope to gain any clear ideas of the phenomena of animal colouration, or the more complex conceptions of mimicry or protective resemblance. For instance, it has been proposed that the striped Tiger finds the protection of "aggressive mimicry" by the blending of its colours, or the assimilation of the same, with the reeds or bamboo clusters in which it hides. This is undoubtedly true so far as our own sense organs or powers of sight are concerned ; but do the Antelopes or other animals on which it preys have the same sensations on the matter as ourselves ? Increase the penetrating power of vision, and the differences will be so clearly seen and magnified that the theory falls to the ground ; decrease the same, and the proposition becomes more capable of proof. And yet this is the crucial question ; one we answer by inferences, but one to which we can give no absolute reply.

Again, what do we know as to the colour perceptions of

* Cases of atrophy following disease appear to be always attended by a corresponding increase of other organs ; blind animals always possess very strongly developed organs of touch, hearing, and smell." Cf. Weismann, 'Lectures on Heredity,' &c., 2nd ed. vol. i. p. 88.

insects?* From experiments made with Ants, Lord Avebury considers as proved that these insects perceive the ultra-violet rays. As he remarks :—"As every ray of homogeneous light which we can perceive at all appears to us as a distinct colour, it becomes probable that these ultra-violet rays must make themselves apparent to the Ants as a distinct and separate colour (of which we can form no idea), but as unlike the rest as red is from yellow, or green from violet. The question also arises whether white light to these insects would differ from our white light in containing this additional colour. At any rate, as few of the colours in nature are pure, but almost all arise from the combination of rays of different wave-lengths, and as in such cases the visible resultant would be composed not only of the rays which we see, but of these and the ultra-violet, it would appear that the colours of objects and the general aspect of nature must present to them a very different appearance from what it does to us."† The late Prof. Riley was of the same opinion :—"So far as experiments have gone, they show that insects have a keen colour sense, though here again their sensations of colour are different from those produced upon us."‡ It is said that certain night-flying insects invariably visit white flowers, as we reasonably believe, because of the easy detection of that colour in an obscure light, and we may accept the night preference to such flowers as an undoubted fact.§ But we cannot say that the hue which we describe as white is the same as that apprehended by the insects. Distinct it must undoubtedly be to secure the permanent selection of their visits, but we can say no more. Because an insect

* "What we, therefore, distinguish as light and colour arises from a subjective property of the retina, inasmuch as it only reacts on certain other vibrations. We might therefore imagine the existence of eyes which could not perceive the intermediate parts of the spectrum as ours can, but only the rays situated at the invisible ends. To such eyes the world would have quite a different aspect." Cf. Bernstein, 'The Five Senses of Man,' p. 104.

† 'Ants, Bees, and Wasps,' p. 220.

‡ Pres. Addr. Biol. Soc. Washington. Cf. 'Nature,' vol. lii. p. 210.—An article appeared on "Animal Vision" in the 'Spectator,' June 8th, 1895, which was really a contribution to the study. The writer remarked :— "There is little positive evidence that the larger quadrupeds, Oxen, Deer, the *Felidae*, or Dogs, have much sense of colour."

§ Prof. Plateau affirms that "the admiration of insects for flowers does not exist." (Mém. Soc. Zool. de France, vol. xiii. 1900. Cf. summary of same papers, Ent. Month. Mag. 1901, p. 211.)

invariably selects and visits a flower of one particular colour, we can only record the observation, but certainly not assume that what we see as white is seen by them in the same hue. Mr. J. A. Harvie-Brown has protested against the assumption "that the colour of insects, as seen by us, is comparable with what may be seen by fish. Fish see through a different medium from ours, and surely we see differently through theirs."* Prof. Plateau, an authority on the physiology of Arthropods, a few years ago published a series of memoirs giving the results of his experiments in endeavouring to ascertain the actual powers of vision possessed by insects and other Arthropods.† Dr. Sharp, of Cambridge, has placed us all under an obligation by giving a condensed account of these observations, and also a critical summary of results. He gives his general impressions as derived from Plateau's experiments as follows:—

"1. Insects in motion are guided largely by the direction of light, and the existence of lights and shades. That when walking they are guided by a combination of light-impressions, with specific habit (that is, going upwards or downwards, towards the light, or away from the light), and by tactile impressions; these latter not acting when the insect is in flight.

"2. That there is at present no evidence at all that the light perceptions are sufficiently complex to be entitled to be called seeing; but that, as the large development of the compound eye permits the simultaneous perception of movement, its direction, and of lights and shades over a certain area, a Dragonfly may pursue and capture another insect without seeing it in our sense of the word seeing."‡

Before leaving this section of our subject, and to make clear our suggestion that little can be justly predicated as to sight preferences or warnings by insects, we may again quote Mr. G.

* 'The Wonderful Trout,' p. 42.

† 'Bull. de l'Acad. Roy. de Belgique,' 1887, 1888.

‡ 'Trans. Ent. Soc.' 1889, pp. 407-8.

Dr. Sharp has elsewhere described the compound or faceted eyes of insects as being "totally different in structure and very distinct in function from the eyes of Vertebrata, and are seated on very large special lobes of the brain, which indeed are so large and so complex in structure that insects may be described as possessing special ocular brains brought into relation with the lights, shades, and movements of the external world by a remarkably complex optical apparatus" ('Cambr. Nat. Hist.' vol. v. p. 98).

J. Storey, who describes the limits of insect vision, in the terms of a coarse mosaic or rough imperfect representation of the external world, the result of the perceptions acquired by their compound eyes; while he asserts that "the insect cannot see more details upon its own antennæ, close as they are to it, than we can with our own naked eye. We must therefore dismiss from our thoughts the mistaken impression that insects see very minute objects far beyond human vision."* Nor can we, as remarked before, conclude that they appreciate colours similarly to ourselves. The question was well put by Lord Rayleigh some years ago, who added the remark:—"Surely this is a good deal to take for granted when it is known that even among ourselves colour-vision varies greatly, and that no inconsiderable number of persons exist to whom, for example, the red of the scarlet geranium is no bright colour at all, but almost a match with the leaves."† The only rejoinder to this proposition at the time was the suggested argument based on the spectrum of the light of the Firefly, which had been found to be perfectly continuous, without traces of lines either bright or dark, and to extend from about the line C in the scarlet to F in the blue. It is composed of rays which act powerfully on the eye, but produce little thermal or actinic effect. In other words, the fly, in producing its light, wastes but little of its power. The writer, however, was careful to add:—"This, it is true, tells us nothing as to the colour sensations of the insect, but it appears to show that the same rays are luminous to its eyes which are luminous to ours."‡ This is precisely the view here again suggested—the same ray or object is seen as by ourselves; but the colour, size, or structure of both respectively may be altogether different, or at least considerably diverse from those apprehended by our own cognitions. This does not, however, necessarily invalidate the conclusions we have formed as to the actual existence of some forms of protection by what we understand as mimicry or protective resemblance. It may be taken to prove that both the object resembled

* 'Sci. Proc. R. Dubl. Soc.' n. s. vol. viii. p. 238.—*Cf.* Joh. Müller ('Zur Vergleichenden Physiologie des Gesichtssinnes,' p. 322), and Burmeister ('Manual Entomology,' Eng. transl. p. 489).

† 'Nature,' vol. xi. p. 6.

‡ J. J. Murphy, *ibid.* p. 28.

and the mimicking creature may possess the unison we see, but under different characters and under different conditions. Thus to a colour-blind person who visualizes blue as green, what we should understand as a wonderful resemblance in a blue animal to its blue environment would be to him the assimilation in colour of two green objects. To a near-sighted person,* the mimicking resemblance of a *Phasma* to the leaf or twig on which it was found would probably be much greater than that appreciated by the possessor of stronger and more penetrating powers of vision; and the same fact as observed by both would, if analytically recorded in each case, be capable of modifying or enlarging our conceptions of the phenomena or theory under consideration. But how much more cogent is this suggestion if we compare the resultant of human power of vision with that possessed by other animals—say, as low in the scale of derivation as insects—whose eyes have a structure so dissimilar to our own, and whose sensory impressions are therefore likely to be so totally diverse.† The very essence of the theory of evolution predicates a vast difference in the sensation of vision, which must vary as the organ does in structure. As Darwin observes:—"Within the highest division of the animal kingdom, namely, the Vertebrata, we can start from an eye so simple, that it consists, as in the Lancelet, of a little sack of transparent skin, furnished with a nerve, and lined with pigment, but destitute of any other apparatus. In fishes and reptiles, as Owen has remarked, 'the range of gradations of dioptric structures is very great.'"‡ Wal-

* Imperfect vision is a frequent cause of illusion. Prof. Sidgwick's Committee of the "Society for Psychical Research" were acquainted with a short-sighted friend who had several times mistaken a "projecting corner of a rough stone wall for a lady with flounced skirts" ('Edinburgh Review,' January, 1895, p. 98).

† Mr. Hickson has pointed out that in some fishes of the deep sea (*Scopelidae*), "not being provided with well-developed eyes or phosphorescent organs to attract their prey, the pectoral fins and the outer rays of the pelvic fins have become elongated, and provided with special sense organs for searching for their food in the fine mud of the floor of the ocean" ('The Fauna of the Deep Sea,' p. 159).—There is a general similarity in the colouring of animals inhabiting these depths with the mud of the ocean floor, but "protective resemblance" can scarcely be claimed when the tactile sense compensates for the loss of sight.

‡ 'Origin of Species,' 6th ed. p. 145.

lace states his conviction that "long- and short-sightedness, and the various diseases and imperfections to which the eye is liable, may be looked upon as relics of the imperfect condition from which the eye has been raised by variation and natural selection."*

Do we not therefore go far beyond the scientific use of the imagination, when, as in the practice now so much in vogue, we not only conclude that every well-established colour and marking, if not advantageous, is certainly not disadvantageous in the struggle for existence, but add the further postulate that they are so by reason that animal vision appreciates them in the same manner as understood by ourselves.

Even among ourselves the power of sight is a variable quantity. Hottentots have been described as possessing keen powers of vision. By the quickness of their eyes they can discover buck and other kinds of game from a great distance; "they are equally expert in watching a Bee to its nest. They no sooner hear the humming of the insect than they squat themselves on the ground, and, having caught it with the eye, follow it to an incredible distance." † Lumholtz gives a similar testimony. "The Australian Bee is not so large as our House-fly, and deposits its honey in hollow trees, the hives sometimes being high up. While passing through the woods, the Blacks, whose eyes are very keen, can discover the little Bees in the clear air as the latter are flying thirty yards high to and from the little hole which leads into their store-house. When the natives ramble about in the woods they continually pay attention to the Bees, and when I met Blacks in the forests they were, as a rule, gazing up in the trees. Although my eyesight, according to the statement of an oculist, is twice as keen as that of a normal eye, it was usually impossible for me to discover the Bees, even after the Blacks had indicated to me where they were." ‡ Darwin has remarked, as a result of reviewing the evidence on the subject, that savages are generally long-sighted, and quotes Rengger's experience in Paraguay as to repeated observations that Europeans who had been brought up and spent their whole lives with the

* 'Darwinism,' p. 130.

† Barrow, 'Trav. Interior of Southern Africa,' vol. i. p. 110.

‡ 'Among Cannibals,' pp. 142-3.

wild Indians did not equal them in the sharpness of their senses.* On the other hand, as the result of the 'Report of the Anthropometric Committee, British Association, 1881,' Mr. Roberts stated that the figures gave no support to the belief that savages possess better sight than civilized peoples, and spoke of "the common mistake of travellers in confounding acuteness of vision with the results of special training or education of the faculty of seeing, results which," as he remarked, "are quite as much dependent on mental training as in the use of the eyes." As pointed out by Haeckel, our own eyes are subject to the law of divergent adaptation. "If, for example, a naturalist accustoms himself always to use one eye for the microscope . . . then that eye will acquire a power different from that of the other. . . . The one eye will become short-sighted, and better suited for seeing things near at hand; the other eye becomes, on the contrary, more long-sighted, more acute for looking at an object in the distance. If, on the other hand, the naturalist alternately uses both eyes for the microscope, he will not acquire the shortsightedness of the one eye, and the compensating degree of long sight in the other, which is attained by a wise distribution of these different functions of sight between the two eyes."† And so, even at the risk of being accused of rank Lamarckism,‡ may

* Cf. 'Descent of Man,' 2nd ed. pp. 38-4.

† 'History of Creation,' 4th ed. vol. i. p. 269.

‡ By many evolutionists who advocate Darwinism as sanctioned by Weismannism, it has recently become the vogue to not only decry Lamarck, but to denounce what they consider as the Lamarckian heresy. Not only have his views been condemned and ridiculed, but even his honesty has been called in question. Thus a recent writer, after remarking on the extraordinary coincidence of the independent conception of "Natural Selection" by Darwin and Wallace, cannot adopt the same view as to some coincidences in the writings of Lamarck and Erasmus Darwin; and although the first named, in his 'Animaux sans Vertébres,' states that his theory is the first that has been presented, this does not satisfy the suspicions of his critic, who writes:—"But if Lamarck borrowed without acknowledgement, it would be but a small step further to write the passage in question" ('Nature,' vol. lii. p. 362). Prof. Osborn, in his 'From the Greeks to Darwin,' has examined, discussed, and reduced this imputation to the character of "unproved slander." How different is the verdict of one well able to judge. Huxley writes of "the famous naturalist Lamarck, who possessed a greater acquaintance with the lower forms of life than any man of his day, Cuvier not excepted, and was a good botanist to boot" ('Collected

we not assume a similar process to have occurred with the eyes of insectivorous birds to whom a microscopic search for insects becomes a necessity of life ; whilst the soaring Vulture has developed a long-sightedness which enables it, if not to see the quarry, at all events to discern its distant companion descending to the same. We have said we may be accused of Lamarckism, because it does not seem to be allowed by many of the followers of Weismann that an acquired character may be capable of being perpetuated and accentuated by the action of "Natural Selection."*

As with insects, we know little of the sight perceptions of other and much more highly developed animals. When in South Africa, I kept a young Baboon, who seemed pleased, at the decline of day, to mount a low roof, and watch the setting sun. I gazed at the same, but did we both see a similar appearance ? † Turner could see and paint a sunset unappreciable by the senses of ordinary men who possess similar organs of sense. What did my Baboon see as he gazed in the same direction as myself ? The question seems unanswerable. Could it have faithfully drawn and painted what it saw, such a picture could only appear to my senses as an exact representation of what I now see, and

Essays, vol. ii. p. 11). And again he remarks :—"The Lamarckian hypothesis has long since been justly condemned, and it is the established practice for every tyro to raise his heel against the carcase of the dead lion" (*ibid.* p. 12). When the devoted disciples of Weismann, aghast at the least argument for some amount of direct environmental change or inheritance of acquired character, raise the cry of "Lamarckism," we are reminded of the XXXII controversial stratagem described by Schopenhauer :—"If you are confronted with an assertion, there is a short way of getting rid of it, or, at any rate, of throwing suspicion on it, by putting it into some odious category ; even though the connection is only apparent, or else of a loose character. You can say, for instance, 'That is Manichæism,' or 'It is Arianism,' or 'Pelagianism,' or 'Idealism,' or 'Spinozism,' or 'Pantheism,' or 'Brownianism,' or 'Naturalism,' or 'Atheism,' or 'Rationalism,' 'Spiritualism,' 'Mysticism,' and so on" ('The Art of Controversy,' Bailey Saundar's transl. pp. 41-2).

* H. M. Bernard has apparently used a similar argument for "the transmission of acquired characters by inheritance, this inheritance coming in as a natural term at the end of a long series of individual acquirements" ('Nature,' vol. 1. p. 546).

† According to Topinard, "the organ of vision is similar in man, the anthropoid apes, the pithecians, and the cebians" ('Anthropology,' p. 95).

therefore believe to exist. The Baboon could only represent the phenomenon under the colours as they appeared to him, but if such colours have a different appearance to me, both picture and subject would still be identical, and prove absolutely nothing. To take an extreme illustration. Suppose what is white to me is black to my Baboon, and *vice versa*. If my animal faithfully paints a white flower as black, as it sees it, the picture must still show a white flower to me, because of our different sense appreciations.*

Leeches (*Clepsine*) afford a good instance of the variety in sense perception. Prof. Whitman has paid much attention to these animals, and writes :—" Pass the hand over a dish in which a number of *Clepsines* are resting quietly on the bottom, and at a distance of a few inches above the animals, taking care not to make the least jar or other disturbance. If the animals are quite hungry, the slight shadow of the hand, imperceptible though it be to our eyes, will be instantly recognized by them, and a lively scene will follow, every Leech rising up, supported on its posterior sucker, and swinging at full length back and forth, from side to side, round and round, as if intensely eager to reach something. Put a Turtle in the dish, and see what a scramble there will be for a bloody feast. The shadow of the hand was to these creatures like the shadow of a Turtle swimming or floating over them in their natural haunts, and hence their quick and characteristic response. A piece of board floating over them would have the same effect. Although so sensitive to a small difference in light, the *Clepsine* eyes can give

* This may also be illustrated by the perceptions of persons suffering from red-blindness. As Bernstein observes :—" The world must appear to them quite differently coloured to what it appears to us. What looks to us white, must to them have a greenish-blue appearance, because red is wanting in it ; and yet they call it white, because it comprehends the whole of their series of colours " ('The Five Senses of Man,' p. 115). Even our own sense perceptions may be only temporary. We call a body white when it reflects all the colours of the spectrum in the proportions in which they are contained in sunlight. As Bernstein further remarks :—" It is very probable that the kind of light which we call 'white' would not remain the same if the proportion of the colours in the light of the sun were to alter ; and since we suppose even the sun and its light may not remain the same for ever, it is quite possible that our descendants may have a perfectly different idea of white to what we now have " (*ibid.* p. 162).

no pictures, and hence there is no power of visual discrimination between objects. They probably recognize their right host by the aid of organs of taste, and at any rate they are often able to distinguish their host from closely allied species."*

It is a long jump from a Leech to a Rhinoceros, but the principle is the same, though the animals in a developmental sense are so widely divided. Dr. Livingstone describes the Rhinoceros as having such dimness of vision as to make it charge past a man who has wounded it, if he stands perfectly still, in the belief that its enemy is a tree. Dr. Livingstone, however, adds that this imperfect sight probably arises from the horn being in the line of vision, "for the variety named *Kuabaoba*, which has a straight horn directed downwards away from that line, possesses acute eyesight, and is much more wary."† Mr. Scott Elliot feels sure that the East African Rhinoceros cannot see clearly for more than about fifty yards.‡ Mr. Blanford, writing on the Abyssinian Rhinoceros, states that "they are easily eluded by turning, as they are not quick of sight, and, like most mammals, they never look for enemies in trees; consequently a man two or three feet from the ground will remain unnoticed by them if he keeps quiet."§ Elephants are reported to have a most defective power of sight, and, generally speaking, among mammals, as a rule, the world, as known by their senses, is probably, if we judge by vision alone, a much more circumscribed one than that cognized by ourselves. With other senses much more developed, and with the addition of some of which we are totally ignorant, nature may be to them revealed beyond our imagination.

According to Dr. Günther, fishes, in the range of their vision and acuteness of sight, are very inferior to the higher classes of vertebrates; yet, at the same time, it is evident that they perceive their prey or approaching danger for a considerable distance; and it would appear that the visual powers of a *Periophthalmus*, when hunting insects on mud-flats of the tropical coasts,

* "Animal Behaviour," Biol. Lect. Marine Biol. Lab. Wood's Holl, Mass. 1898, p. 293.

† 'Miss. Trav. and Research in S. Africa,' p. 136.

‡ 'A Naturalist in Mid-Africa,' p. 247.

§ 'Obs. Geol. and Zool. Abyssinia,' p. 248.

are quite equal to those of a Frog.* The Norwegian fishermen whitewash the rocks in the vicinity of their nets, or, where there are no rocks, erect white boards, or suspend sheets, which are termed "Salmon attractors," designed to represent the foam of the cataract, which the Salmon is seeking to ascend. But while the white colour is found attractive, the fishermen believe that the fish avoids red colours, so that red clothing is carefully discarded; and, according to Bishop Pontoppidan, even red tiles have been removed for this reason from a fisherman's house.† Dr. S. Dixon, a president of the Pennsylvania Academy of Natural Sciences, in Philadelphia, had a large aquarium containing goldfish and other aquatic creatures, which he was in the habit of feeding every morning. During the winter, according to the 'New York Tribune,' he wore dark coloured clothing, and as soon as he approached the glass tank all the fish came to the surface of the water looking for crumbs. Changing his clothes to light-coloured fabrics the first day of May, the fish failed to recognize him, and went without food for two days. In fact, we cannot always conclude that the possession of eyes in some fishes is an indication of sight. According to Mr. Beddard, many deep-sea animals are totally blind; yet many species found in the deepest hollows of the ocean appear to have perfectly normal eyes. These discrepancies were partly accounted for by the theory of abyssal light. The histological study of the eyes of certain deep-sea Isopoda, particularly of *Serolis* and *Arcturus*, shows, however, that the appearance of well-developed eyes was often deceptive. Anyone, before having recourse to the microtome, would assert that the deep-sea *Serolis neæva* was as keen-eyed as any species of the genus. Yet sections through the eyes show that it is in a condition of degeneration; apart from the faceted cornea, there is but little of recognizable eye-structure left. In *S. bromleyana* the eyes are well-marked, but entirely devoid of pigment; no trace of optic tissue could be found by microscopical investigation. Mr. Beddard is therefore of opinion that there is no need of any theory of abyssal light; it is more likely that the state of preservation of the eyes is an index of the length of time that the species in question has been an inhabitant

* 'Introd. Study Fishes,' p. 111.

† Cf. Seeley, 'Freshwater Fishes of Europe,' p. 271.

of the deeper waters.* The sight perception of fishes is clearly a phenomenon, of which we have practically the smallest information, and the scantiest imagination.

It is even probable, as Bernstein has proposed, that the perception of the external world is essentially an act of the mind, which has its seat in the cerebrum, and is connected with this organ; and, further, that the sensory organ, with its nervous connections, only affords the brain the material which it converts into a Sensory Perception.† For it has been observed with Pigeons, that upon the removal of the cerebral hemispheres, in which state they may live for some time, they still possess a sensation of light, which penetrates the eye, and causes a contraction of the pupil; an action which can only be caused by the central organ of the optic nerve in the brain. But a comprehension of the objects seen—*i. e.* a true perception of the senses—is no longer possible to these animals. They behave like blind animals, run against every obstacle, and no longer possess the power of recognizing the objects seen as belonging to the external world.‡

If it is granted that the perception of the external world is essentially an act of the mind, and has its seat in the cerebrum of man, and that Pigeons are proved to have the same relation between their sight perceptions and the integrity of their cerebral hemispheres, then we cannot hesitate to apply the qualifying influence of difference in evolution of cerebral matter between man and other animals as largely modifying their power of equally appreciating by sight the shape, colour, and size of the different natural objects around them. We may therefore pause before concluding that the insectivorous mammal, bird, or reptile sees as we do the "protective" or "non-protective" shape and colouration of its prey, or that the bird to the insect, or the insect to the bird, appears to each, as both to ourselves. And so with all that we consider "warning colours," a great element of error may exist in our calculations, owing to a difference in the sense perceptions of the animals most clearly interested in the theory formulated.

* 'Natural Science,' vol. vii. p. 56.

† Cf. 'The Five Senses of Man,' p. 163.

‡ *Ibid.* pp. 162-3.

AN OBSERVATIONAL DIARY OF THE HABITS—
MOSTLY DOMESTIC—OF THE GREAT CRESTED
GREBE (*PODICIPES CRISTATUS*), AND OF THE
PEEWIT (*VANELLUS VULGARIS*), WITH SOME
GENERAL REMARKS.

BY EDMUND SELOUS.

I MUST premise that for many mornings before the date at which I commenced to take notes I had watched this pair of Grebes, but seen nothing which struck me as of interest. I could not detect a nest, nor were the birds building; so that, judging by the dates and the working hours of last year, I thought all this was to come. As it turned out, however, last year was no criterion for this, and I regret now that I did not begin watching sooner, and stay, each morning, later. As the nest—which, I afterwards found, had been already completed—seemed much less massive, and generally inferior to the ones I had previously seen made, it would have interested me to have observed whether there was any corresponding difference in the building of it, anything suggesting that it was built with an object other than that of incubation—or rather, with such other object alone. Of this, however, I will speak later. It is, of course, impossible actually to prove that these Grebes were the same ones that I have before given an account of.* But as they were the one and only pair on the same sheet of water, and as the nest was in approximately the same place, I assume and feel personally quite certain that they were. As will have been gathered, though I have not expressly stated it, there was only one pair of Grebes (and, for a few days, an odd bird) on the water last year. I now commence my diary.

April 22nd, 1901.—Something is now visible in the conduct of the two Grebes, which seems to betoken the approach of nuptial activities. They seem to become excited, occasionally, together. One dives, and is instantly followed by the other.

* *Ante*, p. 161.

They dive, too, sometimes, in a more splashy way, particularly once, when the male, I think, went down, kicking the water up behind him in an exuberant spirit. Once one of them—I think again the male—comes up with something in his bill, which he dabbles about on the surface, and seems to sport with, the other coming close up and appearing to take an interest. I do not think this something is a fish; it seems too weighty and voluminous, nor do I catch a gleam. I think it is weeds, and pregnant with associations of nest-making, love-making, dalliance on the nest. Once, too, the male flies suddenly some way off over the water, and sometimes the two come close together, fronting each other, and snapping their bills a little. Once or twice also the female bird—as I think it is—has lain all along on the water. I can see no sign of a nest yet, and do not think one has been begun.

April 23rd.—These Grebes have a note which may be described as a kind of bastard quack, for it has much of the qualities of the latter, though harsher and much thinner. In my experience, however, it is seldom uttered, inasmuch as I had not noticed it before the other day, though distance may have had something to do with this. Whilst floating on the water they will sometimes stick a foot right up in the air, and waggle it. One of the pair—the female—has just done so, and it has a very odd effect. Both birds are now fishing. Each has caught a fish, and swallowed it on the surface. There was nothing further to note up till the time I left, which was about 6.30 a.m.

April 24th.—Arrive about 5.30 a.m., and during the earlier part of the morning see nothing to note down. Going away after some time, I return about 7, and then notice one of the birds lying along in the way I have so often described, on a thin patch of weeds extending a little from the shore. This bird is certainly the male, and—just as before—the female swims up, and makes several times as though to spring up also, going and returning, but each time failing to do so. The male then comes off, but almost immediately leaps up on the weeds again, just as he had done on the nest last year, and, assuming the same attitude, there is the same scene over again. Afterwards, when both the birds had swum away, I walked along the bank to the place. It was, as it had looked, a thin line of weeds, which, though

growing, had more the appearance of driftage. Just where the one bird had lain, however, the weeds were thicker, and it certainly looked as though they had been added to. This suggests, of course, that here may be the beginning of a nest; yet of building it I have, as yet, seen no sign. Possibly the birds find pairing in the water difficult, if not impossible, and therefore choose for this purpose a natural foundation of weeds, to which they add when greater stability is needed.

April 25th.—Arrive at 6.30 a.m., and find the birds swimming about. In a little while they both swim to the same little belt of weeds, but if, as is probable, with the intention of pairing, this is not followed up. Several times they front each other in the water, and, with their snaky necks reared up, *tâter* a little with the beak, or make little tosses of their heads in the air.

It is pretty to see these Grebes drink, which they do with a little scoop of their bills on the water, raising, then, the head quickly, till the beak spears perpendicularly up at the sky.

8 o'clock.—The two have just swum to the weeds again, and one of them—I think, this time, the female—lies along amidst them, but without jumping up on to anything. There is nothing further, however, and they soon swim away. But very soon afterwards they return, and one—I think, the male—jumping up and lying along, the other, in a moment or two, follows, and pairing takes place. The second upspringing bird—the one that has just, apparently, performed the office and function of the male—now comes off the platform of weeds, passing forward along the body of the other one, and leaving him upon it. It certainly seems the smaller of the two, and when the other, shortly after, also takes the water, and both are together, this latter seems again, as before, to be the larger, and the one which I have always known and recognized as the male. I carefully keep the two separate with the glasses. A little while afterwards the birds again approach the weeds, and again the male (quite certainly) leaps up and lies along them. He evidently waits for the other—the female—but she this time does not comply. He comes down, follows her a little, they turn, he again leaps up, waits, looks round and waits, but to no purpose. Coming off again, he now (for the first time that I have yet seen) lays some

weeds on the place—whether nest or otherwise—and the female then dives and lays a piece too. They lay two or three pieces between them, but in a very perfunctory manner, and then swim away. Now when the male, as I believe it to have been, leapt up the first time and pairing ensued, he assumed a peculiar pose, curling his neck over and down, with the bill pointing at the ground (weeds) perhaps six inches above it, and stood thus, fixed and rigid, for some moments (as though making a point) before sinking down and lying all along. There was no mistaking the entirely sexual character of this strange performance, the peculiar fixed rigidity full of import and expression. On the two subsequent occasions of his leaping up he made precisely this same pose ; his actions from first to last—from his approach and leap to his lying along—were identical in every respect. That it was the larger of the two birds on these two second occasions (the one that I have seen last year act as the male as well as as the female) there is no doubt whatever, and I have hardly, if at all, less doubt that it was the same one (the male) on the first occasion also, and that the female acted as the male bird usually does.

April 26th.—Shortly after I come (about 7 a.m.) the Grebes approach the point of weeds, and, when just off it, front each other, toying with their bills. There is nothing further, however, and shortly both swim together to the opposite shore, and begin fishing. I see each of them come up with a fish, and swallow it. They then swim back to the platform or nest, and the male, without any doubt (that is to say, the considerably larger one which has performed the usual office of the male on various occasions last year), leaps up, and lies along precisely as described yesterday. The female comes up, and seems about to ascend, but (just as last year, both with her and the male) does not do so, and after a little swims out to a short distance, and remains riding at anchor. The male looks round at her once or twice, then stands up, manipulates the weeds a little with his bill, lies along as before, and waits again. This proving to no purpose, he comes off, and rejoins the female, and both swim quietly in each other's company. This is at about 7.30. At 8.15 the birds return, and there is just the same thing in all essential particulars, the male pulling the weeds about in a desultory manner before coming off into the water.

8.40.—The two again at the weeds; the female leaps up, makes the pose, and lies along just as the male has, on previous occasions, done. The male now swims ardently up, but becomes, as it were, nervous, and remains on the water. After a little the female comes off, and, very shortly afterwards, the other—the male—leaps on to the raft, poses and lies along, just as he has done before, and just as the female has done a moment ago. But, as is so frequently the case, the matter proceeds no further.

May 1st.—Got to the water at about 7.30 a.m., and could see no Grebes there. Walking along the shore to the weeds, I found the nest—for I now think it is one—apparently no further advanced than when I last saw it. It is hardly raised above the water, and quite unnoticeable through the glasses, or when not looked directly down upon from quite near. Walking back, I saw both the birds in a part of the water they do not so often visit, and for some time, now, they fished, and I saw them catch and eat several fish. Then they fronted each other in the water, and, erecting their long necks, *tatéd* a little with the bills in their usual manner, after which they seemed going to the nest, but the intention did not hold. There was now another long interval, and then just the same again, and afterwards I came away without anything further having taken place.

May 2nd.—At 7 a.m. I find the Grebes as before, swimming lazily about, that is to say, and catching and eating a fish now and again, with an easy grace. Nothing of a nuptial character takes place till after 8, when something interesting, and which I have not before seen, does. The two are on the opposite side of the water to the nest, and, fronting each other, *táter* first with their beaks. Then the female dives, and comes up with a small piece of weed, which she, I think, lets drop. Immediately afterwards—but whether before or after she comes up I cannot quite say—the male dives too—excitedly, I think—and, coming up with a larger piece of weed, the two again front each other, and all at once both of them leap entirely upright in the water, standing, it would seem, on their feet, either upon the water itself or on the mud or weeds just below its surface. This latter I think it must be, since they are now right on shore, and their movements seem to imply a firm basis of support. Still, they have dived, and

been entirely hidden in almost, if not exactly, the same spot, so that its shallowness seems a little difficult to understand. They look like two Penguins, and each, as they stand face to face, must have the fullest view, not only of the front, or throatal, part (which is silvery) of the long and straightly stretched-up necks, but of the whole broad silver surface of the breast and body. Immediately after they have assumed this upright attitude, the hen-bird catches hold of the dangling end of the weed which the male has brought up, and both, holding it between them, make little waddling steps, now forwards, now backwards, but not going more than a few inches either way. I would say that they *chassé'd*—for it had that effect—but the motion was as described, and not from side to side. Even though it is a dull day, with no sun visible, the effect of this—of the two broad silver shields—is most magnificent. They gleam dazzlingly, yet softly; but what must it be when the whole air and water is dancing in glorious sunlight, as it has been all this week, whilst the most tiresomely timed influenza was keeping me indoors! Whether it is a conscious display or not—and the part which the weed here plays makes me doubt this—the birds could not have adopted an attitude or a position in relation to one another better adapted to show off the beauties of their plumage as a whole. The entire surface of silky silver is exhibited by each to each, whilst the crest and tippet is also much *en évidence*.

Having remained thus—upright and moving backwards and forwards as described—for quite an appreciable space of time, both birds sink down again on the water, the piece of weed which they had all the while been holding falling disregarded between them, and the male sets off, full of intention, to the nest on the opposite shore. The female follows, but she lags, pauses when about half-way there, and is some way behind when her husband reaches the nest, and, leaping up, lies along on it in the usual manner. Having come up, she makes ready to ascend, then pauses, swims out again, returns, and does the same several times, the male all the while lying in the attitude he has at first assumed. Then, however—after all these disappointments—and having first looked round, as on former occasions, he begins to move and arrange the weeds with his bill, and afterwards, taking the water, rejoins the female. They float negligently on the

water for a little, then swim together to the nest, and, keeping them perfectly distinct through the glasses, I can say with conviction that it is the male who again, now, leaps up, makes the pose, and assumes the final attitude so often mentioned. The female now acts as before for a little, but on—I think—the first return after swimming a short distance out, springs up, and pairing takes place, she performing, as far as attitude and relative position are concerned—absolutely as far as the eye is capable of detecting—the function and office of the male. Immediately after the pairing she comes forward along the body of the male—on which (as in every case upon either side) she stands perfectly upright—and takes the water, whilst the latter remains on the nest for a little while afterwards before coming down and following her—for she has now swum away. As just before in the ascent, the glasses again say decidedly that it is the male that has descended last from the nest, and the female that has come off before and swum away. The difference in size between the two is very apparent, and if we say (as anyone seeing this morning's drama alone would say) that the larger bird is the female, then I have seen this very bird act last year, time and time again, as the male, whilst the other (which we must in that case suppose to be the male) acted, in the pairing process, the usual part of the female. It must also be remembered that, although last year the transmutation of sexes—as we may call it—between the two birds was not carried by the female to this extreme point, yet up to this point, and in every other particular I saw each of them assume, alternately, and in more or less immediate succession, the character proper to the other. Personally, therefore, I have no further doubt as to this salient peculiarity (for as such it strikes me) in the sexual relations of these Grebes, and, as I can see nothing here, in the shape of artificial conditions, to suggest its being an individual one (or, rather, an idiosyncrasy shared by two individuals), I suppose it to be specific. If so, that vitiation of the sexual instincts in domesticated birds to which Darwin may perhaps allude ('The Descent of Man,' p. 415) may not really be due to artificial conditions, but natural, in the ordinary sense of the word; for, of course, in a larger sense, everything is, and must be, natural, a fact not sufficiently appreciated by those who, in their investigations—or rather, let us say, their

chaperonings—of nature, seem always to be fearful lest their precocious young *protégée* should “go too far.” “Supernatural” is an absurd word, if construed literally, as it seems to be by a great many people. With regard to such birds as domestic Pigeons and poultry, were anything very *outré* in their sexual relations to be observed, it would be natural to attribute it to high feeding or artificial conditions generally. But in how many wild species (living a wild life), and upon how many occasions have such matters—such *intima arcana*—been observed? Moreover, as I have already remarked, the thing goes deeper, and requires something of a more general and abiding nature to explain it. As to this, I am unable, myself, to add to what I have already suggested; but I would just *en passant* (in case it might have any significance) draw attention to the fact that in the Great Crested Grebe we have an example of a specially adorned species, the sexes of which are identical, except in size. This, I believe, is not a common thing amongst birds.

I believe, however, that facts such as I have here recounted may throw light upon much that is puzzling. It is a general view that in the human species the masculine and feminine nature differ considerably, if not essentially; but facts pointing in a contrary direction have sometimes been adduced, as, for instance, that many poets exhibit in portions of their writings qualities that seem feminine rather than masculine. This has been specially remarked of Shelley, but to me it appears much more obvious, and beyond mere matter of opinion in the case of great creators of character such as—to take the most familiar and salient example—Shakespeare. Is it not, really, a very remarkable thing that a man and not a woman should have created Cleopatra, Cordelia, Hermione, Perdita, Constance (those mother-scenes in King John), and so forth? Anyone, I suppose, who has ever read Shakespeare to purpose, must have received the impression that such perfect and consistent organisms, such actual living growths, such vitally informed entities, are beyond the powers of even the keenest observation—that they must have been felt rather than imagined even, and therefore must have belonged to the essential being of the mind from which they emanated. Yet to say that a man can truly and justly feel the feminine nature in its more essential manifestations is to

say no less than that he is in his psychology as much a woman as a man ; which is what, for my part (and *vice versa*), I am inclined to believe—though, of course, in ordinary persons, the one or the other portion is, generally, more or less in abeyance.

Now it will be admitted—or, at any rate, it seems likely—that the principal differences in the psychology of the sexes have their root in the sexual separation itself, inasmuch as certain main channels of thought and feeling seem by this to be cut off from the one sex or the other, especially from the male one. In the ‘Heart of Midlothian,’ the old hag, who has once nursed Robertson, says to the thief, Levitt, “And man can never ken what woman feels for the bairn she has held, first, to her bosom”; to which he replies, “To be sure, we have no experience.” Were this and many other similar propositions so true as they appear to be, I believe that such man-creators as Homer, Sophocles, Euripides, Shakespeare, &c., would either have left female man alone, as not being content with mere portrait-painting—what we call “study of character”—or else that their productions in it—due to ulterior motives—would have been as notoriously dummies as they are notoriously not. But if either sex has lying latent within it (by inheritance dating from a long-past ancestry) the whole stock of feelings proper to the other, and if what we call creative genius is, or at any rate involves, the power of recalling and shaping these and other—to the many—practically lost possessions, then that quality of *being* another sex which a great poet or writer exhibits in his work is less difficult to understand. There being a foundation (the mental equivalent of those structural retainments which *both* sexes possess) dating from an incalculable antiquity, all the subsequent modifications and developments might conceivably have been added to it, the civilized man or woman receiving respectively the latest and highest touchings (not so extraordinarily high perhaps) of civilized womanhood or manhood, to lie—for the most part undreamt of—in that region of their mentality which has come right down from long-past hermaphrodite forms. Should this appear incredible, I would ask what is the real meaning of the facts which I have here given in regard to these Grebes, and which obviously cannot be explained—(as some other *apparent* abnormalities of this class observable amongst animals may

appear to be)—by there being any check or obstacle in the way of the ordinary sexual instinct? To talk of perversion or vitiation seems to me merely to shirk difficulties, and substitute words for an attempt at a rational explanation. Here are two wild creatures, whose acts must, I think, be assumed to be the outcome of a genuine primary feeling or instinct, unchecked, on the one hand, by any sense of impropriety, and, on the other, unassisted by any pruriency of imagination as we understand it. Each of them acts—and must therefore, also, feel—in turn as the male and female. They are hermaphrodites, in fact, as far as feeling and—to the extent possible—acting is concerned. Vast as must be the interval between them and their hermaphrodite progenitors, I can, myself, see no other explanation of the facts than their having had such progenitors, and if a cause so remote can reach so far down the stream of time, why not farther still?

Returning, now, to the sport or antic which immediately preceded the pairing—or whatever it may be called—of these two Grebes, the special feature of this was, I think, the mutual holding by them, in their bills, of a piece of weed which the male had excitedly dived for and brought up. For the excitement of both birds appeared to me to refer in a special manner to this possession, nor do I think that the upright attitude was assumed in order to display the plumage, though it necessarily had this effect. The weed alone, as it seemed to me, was the occasion of the curious waddly steps backwards and forwards, and it was seized by the female either immediately before or immediately after she stood up. True it was at last dropped, but the instant it was both birds set out for the nest, and we have seen what followed. A suspicion may, perhaps, cross the minds of some that the supposed weed was a fish, and that the birds were fighting for it. But besides that the consummation which I have just alluded to is opposed to this theory, it is in other respects untenable. The birds were close, for the glasses, and I saw the dank, green, dripping substance quite distinctly. Not only, too, have these Grebes never fought (and they might as well fight for the water as for fish), but they have never had, whilst under my observation, one inimical moment. Nor is the particular matter which I have here

recorded of a unique nature. Other birds act, sometimes, in more or less the same way. I have seen a pair of Shags at the nest (but not whilst occupied in building it) hold between them a piece of seaweed, and move their heads about with it in a strange half-coquettish manner, as though they knew what they meant. I have seen Gulls and the Great Skua pick a blade or two of grass, and then run with it to the partner bird, apparently only to show it, for it was dropped and not used in building the nest, which was not just in that place. Each time there was a peculiar kind of consciousness in the manner and look of either bird, impossible not to notice and equally so to describe. I have also seen one of two rival Wheatears, in the midst of violently excited movements, catch up a piece of grass or stick, and run and lay it in a depression of the ground out of which it had just started. In most of these cases, as it has appeared to me, the object thus seized hold of is in the nature of a symbol. That anything used in the construction of the nest should—during the nuptial season—fill the bird's mind with a picture of its construction, and with all the ideas and associations connected with this, we can understand; and, as male birds fight together, at this time, for the possession of the female, it does not seem impossible that a vision of what such possession implies should sometimes pass through the mind of either combatant, when not in the actual frenzy of combat. In the case of the Wheatear, however, there may be another way of explaining this action, to which I will recur. In the other instances its symbolic nature seems more apparent. Especially is this the case with these two Grebes. They seized hold of and moved about with the weed, very much as a man might seize and wave a banner, and a certain set of pleasurable ideas and emotions—to do with nest-building, courtship, dalliance on the nest—became, as it were, focussed by their doing so. Held by both, it was a symbol of what both felt, and of all that related to their mutual affection. I do not, of course, mean to suggest that the birds were conscious of the symbolical meaning of what they did in the way in which a man would be, but if their action was not in its essential nature symbolical, then will anyone explain its precise significance, and why it was so immediately followed by an eager

love-journey to the nest, which was at a considerable distance off? There are, I believe, some—possibly many—peoples amongst whom the ceremony of marriage consists in (or includes) the bride and bridegroom sitting or standing together, either side by side or opposite each other, and holding or grasping something between them. The object, whatever it is, is symbolical of the married state. In every essential except the clear consciousness that they were doing so (to how great an extent this was present or wanting it would, perhaps, be difficult to say), these Grebes, as it appears to me, went through a marriage ceremony.

(To be continued.)

NOTES AND QUERIES.

MAMMALIA.

Note on the Scaly Ant-Eater (*Manis temmincki*).—To trace the origin of curious native sayings or superstitions concerning animals is always a matter of interest, and there are few animals in this country which have given rise to more of these than the Scaly Ant-Eater, or “Aka,” as the natives call it. Among the Mashonas this weird beast, which looks more like a reptile than a mammal in its general appearance, used formerly to be regarded as a special perquisite of the chiefs, and woe betide any venturesome persons who dared to regale themselves on its much-prized flesh, as the punishment for this was death ; and, according to most of my informants, the offender was usually killed while asleep, though I failed to find out whether there was any special reason for this. On the other hand, if the lucky finder of one of these animals fulfilled his duty by bringing it to his chief, he was presented with a cow as a reward. The reason for this munificent payment is probably due to the assertion of the Kaffirs that this animal has gold in its entrails. “Not the white man’s gold,” as one of my “boys” informed me, “but Portuguese gold”; meaning thereby that I was not to expect to find sovereigns, but raw gold. On inquiring further from this youth, who belongs to Chikwakwa’s tribe, I was told that the Pangolins were very scarce about his home, and there were only certain Kaffirs who knew how to find them ; that they lived principally near the big rivers, and would come out at night to dig in the ground for the gold on which they feed. I had always regarded this eating of gold as more or less of a myth, but recently a wounded Ant-Eater came into my hands, being only the second specimen which I had seen alive, and I was determined to see whether there was any foundation for this curious belief. After the animal had been skinned, I carefully examined the contents of the stomach. This contained numerous heads of a large-eyed termite (*Hodotermes*), which is common in many parts of the country, but mixed with these was a good handful of quartz pebbles and sand. On seeing this, not only the origin, but also the probable truth of the natives’ assertion became obvious at once ; for when digging into the nests of ants and termites, and

licking up the insects with its sticky tongue, the Pangolin must necessarily swallow a considerable amount of earth and gravel as well. Now, as I myself have seen, it is often possible in the gold-bearing districts to obtain a good show of "colour" by panning a piece of earth broken at random off a termite-heap, and if in such a locality the Pangolin is liable to swallow a certain amount of quartz pebbles as well, its chances of picking up gold would be much increased. Although the amount of the precious metal swallowed at any one time would be small, yet it would probably tend to accumulate, as the gastric juice would not act upon it. Thus that which, at first sight, appears to be an absurd belief, will probably prove to be an actual fact. Unfortunately the animal which I examined had come from a locality right in the granite formation, and far from any known gold-belt; so that when I panned the quartz from its stomach no gold was to be seen, although there was a good "tail" of pyrites. Some Blantyre natives in my employ said that the Pangolin was common in their country, but that they never ate it, nor did they know anything of its auriferous qualities.—GUY A. K. MARSHALL (Salisbury, Mashonaland).

[I have known this interesting genus on two continents, and the scaly skins of specimens from the Malay Peninsula (*Manis javanica*), and the South African species on which Mr. Marshall has written, are before me now. The word Pangolin is derived from the Malay *Penggoling*, signifying the animal which rolls itself up.* The contents found in the stomachs of these animals in the east are identical with what Mr. Marshall discovered in his South African species. Cantor found the stomach of a *M. javanica* extended by the remains (head and legs) of large black ants, and also "five small rounded fragments of granite."† In the Ceylon species (*M. pentadactyla*) Tennant found a quantity of small stones and gravel, "which had been taken to facilitate digestion."‡ Mystical properties are also ascribed to the animals in the east. Diard and Duvaucel, writing from Bencoolen, state that, owing to the wonderful medicinal properties attributed to their scales and nails by the natives, they found it very difficult to procure specimens.§ In the Indian highlands, Ball relates that the prevalent native idea is that the creature is a land-fish, and that its flesh has

* Marsden, 'Sumatra,' p. 118.

† 'Cat. Mammalia, Malayan Peninsula and Islands,' J. A. S. Beng. vol. xv.

‡ 'Nat. Hist. Ceylon,' p. 47.

§ Cf. Miscell. Papers relating to Indo-China and Ind. Archipel. ser. 2, vol. ii. p. 201.

"aphrodisiac properties."* In Sumatra the scales are valued by the natives for their medicinal qualities.† In Borneo, according to Bock, their flesh is highly esteemed by the Chinese.‡ Hornaday, of a body "made a delicious stew, rich, sweet, and well-flavoured, and part of it we roasted."§ I could always procure living specimens when living at Province Wellesley in the Malay Peninsula, but never succeeded in keeping them alive in captivity.—ED.]

AVES.

Sparrow-Canary Hybrid?—At Frampton Cotterell, Gloucestershire, last June, a bird was shot from among the Sparrows on a farm, of which the following is a description:—General colour yellowish white, dusky on the head and throat, and with a few dark marks on the back. Tail and tail-coverts exactly like those of a *yellow Canary*; bill and legs like a Sparrow's for shape and size, but pinky white. It appeared to be one of a brood. One or two other Sparrows seen at the same time were described as being nearly or quite white.—H. J. CHARBONNIER (Redland, Bristol).

Crested Lark, &c., released in England.—Having recently obtained from India a consignment of the Crested Lark (*Galerita cristata*), I liberated nine specimens—a few having died—in Kent on Aug. 24th, letting them out from the train at various points. Most of them went off strongly, but they are rather rough in feather, though in good condition of flesh. I much hope that some pairs will survive and breed, as this interesting species certainly ought to be acclimatized with us, instead of persecuted. On the same day I let out, in the Zoological Gardens, a pair of Black-headed Buntings (*Emberiza melanocephala*), which I had procured from a London dealer. The cock was in perfect condition, and could not be recognised as a caged bird; the hen was moulting rather unkindly, but I thought her more likely to recover if turned out now. This beautiful species particularly deserves to be encouraged, as it is far the finest of the Buntings; any number could be purchased at Bombay in the spring. A few, as is well known, have occurred here. On the last day of July I had released in the Gardens a Rosy Pastor bought in London, which soon vanished. It was perfect in feather, but had a slight malformation of the beak, and two or three

* 'Jungle Life in India,' p. 335.

† Marsden, 'Sumatra,' p. 118.

‡ 'Head-Hunters of Borneo,' p. 246.

§ 'Two Years in the Jungle,' p. 271.

nails missing, which would render it recognisable if met with anywhere. I have a good many of these birds on deposit at the Calcutta Zoological Gardens, and hope to have them forwarded shortly. Should it prove possible to liberate them on arrival, I will of course notify the fact of my having done so.—FRANK FINN (c/o Zoological Society, 3, Hanover Square).

Habits of Alcedo ispida.—While fishing on the old river Kennet, at Theale, about five miles from Reading, on Aug. 7th, I had the pleasure of seeing a Kingfisher going in and out of its hole to feed its young; but the point of my writing is to mention that each time it came out it dived immediately into the stream, and then flew away. My only explanation of its conduct is that its plumage was more or less soiled from the dirty state of the passage to the nest, in which there were four young nearly ready to fly.—GEORGE W. BRADSHAW (Reading).

An unrecorded Kite obtained in Huntingdonshire.—Recently I have been able to examine a Kite (*Milvus ictinus*) that, I am informed, was killed by a Mr. Ullet, of Higney Grange, near Holme, and given to a relation of his, a Mr. Norman, then living at Blunham Mill, in the adjoining county, Bedfordshire. At the back of the case it states: "Preserved by I. Wright, of Kimbolton." It was most probably stuffed in 1836, as at the back of the case a portion of newspaper is affixed bearing this date.—J. STEELE-ELLIOTT (Clent, Worcestershire).

Variety of the Shag.—A curious variety of *Phalacrocorax graculus* has been shot on Arran Island, Co. Galway, and sent to us for mounting. Instead of the ordinary dark green plumage of the back and wing-coverts, this specimen is pale buff-colour, shading into almost white at the extremity of the wing-coverts; back, tail, throat, and breast, beak, feet, and bare space around eyes ochreous brown; irides pale bluish grey. The bird was a female, and in excellent condition. WILLIAMS & SON (2 Dame Street, Dublin).

The Little Bittern in Cornwall.—On June 30th last a Little Bittern (*Ardetta minuta*), with a broken leg, was taken in a public resort at Lostwithiel, Cornwall, known as "The Parade," after being seen about the same spot for some days. It was in a very weak condition, and efforts to revive it having failed, the bird was preserved by a local taxidermist named Higgs, and very well set up. The sex was not noted by him, but the black crown, nape, and back indicate an adult male. The river Fowey encircles a great part of "The Parade," and is bordered by a good deal of marsh-land. The railway runs close to the river, many water-birds being maimed by flying against

the telegraph-wires, and it is probable that the injury to this one was caused in the same way. It seems lamentable that the Little Bittern cannot regain its status as a nesting species in England. The specimen I am recording has been acquired for the Devonport Public Museum.—H. M. EVANS (Plymouth).

Puffin off the Coast of Kerry.—A Puffin (*Fratercula arctica*), pure white, with the exception of the wings, which are of the ordinary colour, was obtained off the coast of Kerry. The bird presented a very striking appearance after death, the colouring of the beak and legs showing strongly against the snow-white plumage of the back, head, and breast. The bird was a male.—WILLIAMS & SON (2, Dame Street, Dublin).

The Origin of the Name "Fulmar."—I am sorry to have delayed my reply to Mr. Meiklejohn, but I did so in the hope of being in town, and having an opportunity of fully ventilating this subject. There can be no doubt that the term "Fowmart" was constantly applied to the Polecat, because we have abundant proof of it in old Scottish documents. But that the term of Fowmart or Foul Mart came to be transferred to the Fulmar is, to my mind, improbable. The great 'Dictionary of the Gaelic Language,' published by the Highland Society in 1828, is the only Gaelic dictionary I happen to possess. It accepts the term *Fulmair* as a Gaelic term without question. I should have expected this, because Prof. Newton, the late Mr. Robert Gray, and other eminent naturalists have done the same. The actual origin of the Gaelic name Fulmair or Falmair is a question for experts to settle. Maclean supplies the very simple explanation that *Fulmair* signifies sottish or stupid ('Sketches of the Island Saint Kilda,' p. 8). This would suit the bird appropriately enough, in view of its apparent stupidity in allowing a noose to be dropped over its head. Jamieson suggests that the term Fulmar may bear some analogy to the Danish name *hav-hest*, i.e. sea-horse ; for the Icelandic *fula* signifies a *foal*, and *mar* signifies the sea ('Scottish Dictionary,' vol. ii. p. 319). I hope that some more competent authority may perhaps be induced to clear this matter up. At all events, I think we may dismiss the suggestion that the *Gaelic* Fulmair is identical with Foulmart or Foumart ; unless, indeed, some strong corroborative evidence can be supplied.—H. A. MACPHERSON (Pitlochry).

REPTILIA.

The Sand-Lizard in the North of England.—In the recent volume of the Cambridge Natural History on "Amphibia and Reptiles,"

Mr. Hans Gadow says that the Sand-Lizard (*Lacerta agilis*, Linn.) "is absent in Ireland and Scotland, while in England it is restricted to the southern half"; and a similar statement is made by Mr. Boulenger in the Hampshire volume of the Victoria History of the Counties of England. The reputed Sand-Lizards, frequently reported from northern counties, generally prove, on investigation, to be large examples of the Common Lizard (*L. vivipara*). This, however, is not the case in Lancashire, and, I believe, in Cheshire, for on the coast sand-hills the true Sand-Lizard was formerly common, and may even yet occur in places where the sandhills are unreclaimed. Lancashire naturalists of the old school knew the Sand-Lizard well, but, as questions of geographical distribution did not greatly interest them, there are few records left beyond the bare fact that the species was common. There are, however, specimens in the Warrington Museum, whose identity Mr. Boulenger has confirmed, which were captured at Southport and Formby, on the Lancashire coast. In Mr. Isaac Byerley's 'Fauna of Liverpool,' published in 1856, the Sand-Lizard is described as occurring "on the sand-hills from West Kirby to New Brighton" (in Cheshire). "At Seaforth, Crosby, and elsewhere" (in Lancashire). Mr. W. D. Roebuck states ('Naturalist,' 1884-85, p. 258) that, after examining specimens sent to him from various North of England localities, and finding that they were only "lightly coloured specimens of the Viviparous Lizard," he did not believe in the existence of the true *L. agilis* so far north, until Mr. G. T. Porritt procured him a couple of specimens from the Southport sand-hills, which he "at once saw were unmistakably referable to that species." He adds:—"Mr. Porritt tells me these Lizards swarm on the sand-hills at Southport, where he has frequently seen them sparkling in the sun with a glistening emerald-green, and sometimes almost golden, brightness." The late Thomas Alcock, in his pamphlet on the 'Natural History of the Coast of Lancashire' (1887), also speaks of the Sand-Lizard at Southport, where he says it was "formerly plentiful on the isolated group of sand-hills at the north end of the town. Hesketh Park, however, now occupies the best part of this locality." In 1862 and 1865 he captured and received a number of examples from this place. Mr. H. O. Forbes, in the 'British Association Handbook' for 1896, says, on the authority of Mr. Linnæus Greening, of Warrington, "Common; Wallasey, Southport, and Formby sand-hills." The Cheshire locality is included on the strength of specimens which were shown to Mr. Greening by the late C. S. Gregson, who stated that he had obtained them at Wallasey. The sand-hills between West Kirby and New Brighton were of the same

character as those extending along the Lancashire coast from Liverpool to the mouth of the Ribble, and it is a generally accepted theory that the river Mersey, within geologically recent times, used to empty itself into the sea considerably to the west of its present mouth; so that at one time the Wallasey coast-line was north of the river. The spread of the suburban residential districts round Liverpool, the growth of seaside resorts such as Hoylake and West Kirby, and the formation of golf-links all along the coast have destroyed a large portion of these sand-hills; but there are considerable stretches in both counties where the Lizard may still exist. The Sand-Lizard is not known in Cumberland or Westmoreland, and, although many miles of the North Wales coast, from the mouth of the Dee westward, are, or were, similar in character to the Cheshire shores, I know of no record of the Sand-Lizard from the Principality. The evidence therefore shows that *L. agilis*, generally considered to be only an inhabitant of some of the southern counties, occurs in the north, on a strip of sand-hills bordering the Irish Sea, from the mouth of the Ribble to the outskirts of Liverpool, and, unless Byerley's and Gregson's specimens were incorrectly localized, on the Cheshire shore from West Kirby to New Brighton. Possibly some of the readers of 'The Zoologist' may be able to give information about existing specimens, or of recently captured examples of the Sand-Lizard in Cheshire.—T. A. COWARD (Bowdon, Cheshire).

INSECTA.

A Dipterous Parasite in the Plumage of Birds.—I enclose herewith some flies which I obtained from among the plumage of a Blackbird caught in a net protecting raspberries on Aug. 5th last at Balcombe, in Sussex. I should be interested to know the name of the fly, and also if its habit of infesting the plumage of Blackbirds and Song-Thrushes is known.—ALFRED T. COMBER (8, Worcester Terrace, Reigate, Surrey).

[This fly has been identified as *Ornithomyia avicularia* by Mr. E. E. Austen, who has added the following note.—ED.]

Ornithomyia avicularia, Linn.—This fly, a near ally of the so-called "Forest Fly" (*Hippobosca equina*, Linn.), which is exceedingly troublesome to Horses and Cattle in the New Forest, and of the Deer-Fly (*Lipoptena cervi*, Linn.), a parasite of the Roe- and Red-Deer, appears to occur indiscriminately in the plumage of most wild birds. The series in the collection of the British Museum includes examples from the Thrush, Red-backed Shrike, Wheatear, Whitethroat, Starling, Pheasant, Partridge, Red Grouse, Rypar (in N.W. Norway), Blackcock,

Snipe, Long-eared Owl, and Green Woodpecker. *Stenopteryx hirundinis*, Linn., another member of the same group of flies, found only in the nests and upon the young of the House-Martin, is very similar in general appearance, but has lancet-shaped wings; while *Oxypteron pallidum*, Leach, has somewhat broader wings, and is confined to the Swift. The so-called "Sheep-tick" (*Melophagus ovinus*, Linn.), which is entirely destitute of wings, also belongs to this group.

The mode of reproduction of these flies is highly remarkable. The female is viviparous, and produces but a single larva at a time, which grows to a large size within the body of the mother before being extruded, being actually nourished by means of a sort of *placental* connection with the wall of the oviduct. As soon as it is deposited the larva turns into a dark brown shining pupa, whence the group of parasitic flies, to which *Ornithomyia* belongs, has been termed the *Pupipara*. Recently, however, a similar mode of reproduction has been stated to occur in the case of the Tsetse Fly (*Glossina*), which is a true Muscid, and a near relation of our common English *Stomoxys*; so that, if this is confirmed, the name *Pupipara* must be abandoned.—E. E. AUSTEN (Brit. Mus. South Kensington).

NOTICES OF NEW BOOKS.

Essays and Photographs. Some Birds of the Canary Islands and South Africa. By HENRY E. HARRIS. R. H. Porter.

A TRIP to South Africa is always enjoyable, especially if a halt is made at the Canary Islands, which can now be easily done by travelling on board one of the intermediate steamers of the Union-Castle line. Mr. Harris has visited both spots as an ornithologist, relying on his camera and not on his gun for the spoils he brought home, which constitute the photographs supplying the material for fifty-five plates. These illustrations alone were well worth publishing, but the author has also supplied some excellent field observations, especially as to nesting habits.

Mr. Meade-Waldo has already published a list of the birds to be found on the Canary Islands, and Mr. Harris has now written a good supplement on a different branch of the science. Nature has not exhausted herself on these islands. We have sailed along the coast of Fuerteventura, but even then did not realize the grandeur of its dreariness as we have by reading some of the pages in this book. It is the fate of most travelling naturalists to visit a region at a wrong or disappointing season, and not to do all that was expected. Mr. Harris seems to have had a similar experience, but he secured photographs of many nests and eggs, that of the Houbara Bustard being one of the most charming and realistic.

In South Africa, Mr. Harris found his happiest hunting-ground in the neighbourhood of the Knysna Forest, a region far too little visited by either ornithologist or entomologist. We are glad to see illustrations of the nest and eggs of the Secretary Bird, and the nesting site of the Hammerkop, though both require larger space than can be afforded in any ordinary book to give a real impression of their massive structure. The author also paid considerable attention to the shore-nesting birds, and gives instances of the intelligent manner in which some Plovers seek

to render their eggs almost indistinguishable from their environment, *Egialitis pecuaria* being a good example of this practice, and its nest is well-illustrated. As we look over these interesting illustrations, we feel that in regions where the birds have been collected and identified the old days of killing and skinning may be considered as closed. The work of the camera has only just commenced, and we would commend to those who have the opportunity, the great possibilities in going over the ground of the old naturalist travellers, provided only with the means of photography. 'The Camera on the Amazons,' the 'Photographer in the Malay Archipelago,' books we would fain see and read.

A Descriptive Catalogue of the Indian Deep-Sea Crustacea. Decapoda: Macrura, and Anomala, in the Indian Museum, &c.
By A. ALCOCK, M.B., LL.D., &c. Calcutta: printed by order of the Trustees of the Indian Museum.

THIS is another result of the good work accomplished on board the Royal Indian Marine Survey Ship 'Investigator.' In our last volume we noticed a similar publication referring to the Deep-Sea Brachyura and Indian Deep-Sea Fishes, and we now receive an enumeration of the Crustacea. But this is more than an enumeration, seeing that full descriptions of all the species are given; in fact, we have a monographic account of the results of an expedition that is a real evidence of an enlightened administration. Like all sectarians, zoologists must—apart from the larger questions—judge governmental departments by the support they give to their own cause. Whether imperialists or republicans, the duty of all zoologists is to see that science is not neglected by the State. A voyage of the 'Challenger' is far more important to us than the measures which seem often designed by well-meaning legislators to show their incapacity for recognizing the trend of evolutionary progress. The work of the Royal Indian Marine Survey Ship 'Investigator' covers a multitude of infirmities in Indian administration, and Dr. Alcock is to be congratulated on the valuable use he has made of his opportunities.

